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BIOLOGICAL EVALUATION OF GOUTY PITCH MIDGE DAMAGE IN PLANTATION 350, STAND 60-004, BIG BAR RANGER DISTRICT, SHASTA-TRINITY NATIONAL FORESTS

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ABSTRACT

Tip and branch dieback of ponderosa pine in an 18-year-old plantation was evaluated and identified as being caused by gouty pitch midge, Cecidomyia piniinopis. A heavy brush component of whitethorn is reducing tree vigor sufficiently to result in the insect impacting the growth potential of the plantation. Three management alternatives are provided and discussed as to their anticipated effects on the plantation. These are no action; do another site preparation and replant, and control the brush and thin.

INTRODUCTION

On June 11, 1986 John Dale and Gregg DeNitto, Forest Pest Management, met with Carroll Powell, Dick Stiliha, and Butch Washington of the Big Bar Ranger District. The District had noted tip and branch dieback during the past two years in a ponderosa pine plantation and requested an evaluation to determine the cause, prognosis for the stand, and management alternatives.

Plantation 350 was planted with ponderosa pine in 1968 following harvesting. It covers 8 acres located in stand 60-004 (T.4N, R.8E, Sec. 21). Site quality is considered at least a high site II (Meyer). The seed source was Zone 10 and may not be suitable to the site. There have not been any recent cultural activities in the plantation. The primary management objective is for timber production.

The objectives of this evaluation were to verify the cause of the damage, to ascertain its extent and severity, and to develop management alternatives that reduce pest-caused impacts to acceptable levels.

OBSERVATIONS

Trees range in height from about 10 to 25 feet. The plantation is at 85% stocking and there is a very heavy component of brush — > 95% whitethorn, <5% other species. An adjacent plantation was planted in 1984 with ponderosa pine and Douglas-fir.

Branch distortion, flagging and tip dieback were common on many pines in the plantation. Of more significance was the loss of terminals on some trees which had been growing well. Other trees showed little or no symptoms of injury. These were among the taller trees in the plantation, but trees with numerous symptoms often were just as tall or taller. The frequency of symptoms appeared to decrease somewhat with distance from the gravel haul road adjacent to the plantation.

In the adjacent plantation, injury to the terminals was evident on many of the two foot tall seedlings. The natural pines (6-15 ft) left after harvesting did not exhibit symptoms of infestation.

Examination of affected twigs revealed larvae of the gouty pitch midge, Cecidomyia piniinopis, within feeding pits in the vascular tissues. Sufficient numbers of resin pockets were present to result in the levels of injury observed.

In addition, at least one ponderosa pine in the plantation had a large bole swelling around much of its circumference. Powdery, orange pustules were present on the surface of the gall identifying it as western gall rust, Endocronartium harknessii.

DISCUSSION

The gouty pitch midge frequently is a pest of ponderosa and Jeffrey pine in plantations in California. The midge adults emerge in the spring as the new pine shoots are expanding. Following mating, the females lay their eggs, either singly or in small groups, on the tips of expanding branches and leaders. The larvae that hatch bore into the shoot until embedded in the vascular tissue. They hollow out a cavity and feed in this resin-filled pit over the winter. Upon maturing in early spring, the larvae emerge from the twig and crawl onto a needle where they pupate. Adults emerge in 10 to 14 days and begin the cycle anew. There is only one generation per year.

Gouty pitch midge populations fluctuate from year to year, depending on natural controls. Usually damaging populations do not persist for more than 2 to 3 years, often less. Sapling and pole-size trees, 4 to 16 feet in height, are the most severely attacked. Trees under 3 years in age are seldom attacked, and attacks on those greater than 16 feet in height are usually restricted to the lower crown.

Host tree vigor does not appear to affect the susceptibility of trees to attack. However, tree vigor can affect the impact of an infestation. Slowly growing trees are more likely to be adversely impacted by the insect as a result of dying terminals and branches. Although the number of pitch midge

attacks may not differ between plantations with relatively greater and lesser amounts of brush, trees under stress from brush competition are probably affected more severely and recover more slowly from attacks than more vigorous, healthy trees.

In addition to trees in brush fields, another situation where damage is often severe is along roads or in other areas subject to high levels of airborne dust. As is often the case with scale insects, the dust may interfere more with the presence of parasites and predators of the pitch midge than with the midge itself. Reducing dust levels by oiling or hardening roads may be beneficial for maintaining natural control of the pitch midge.

There is evidence that ponderosa pine susceptibility is related to the type of surface of the spring shoots. During the period of active new growth, trees will exhibit one of three genetically controlled phenotypes. The shoots will either be resinous, dry and smooth, or covered with a waxy bloom. Trees with resinous shoots are much more prone to serious pitch midge damage, although the midge is capable of developing in all three types of tree.

Typically, gouty pitch midge does not cause mortality, but occasionally very small pines, such as in the adjacent plantation, may be killed. However, the killing of branches and leaders can result in deformity and growth loss. Extensive killing of tips over a period of several years can result in loss of growth potential.

MANAGEMENT ALTERNATIVES

1. No Action. Heavy brush competition and increasing intertree competition will reduce growth of the plantation. Deformities and leader and branch dieback will continue to occur periodically from attacks by the gouty pitch midge. Impacts from the attacks will decrease as the trees exceed 16 to 20 feet in height. At this time, because of tree size and high stocking levels, the probability of successful attacks and subsequent mortality from bark beetles will increase. Overall, the plantation can be expected to have a reduced yield at rotation from what is projected. While the midge population in plantation 350 remains abundant, pines in the adjacent plantation will continue to be attacked, resulting in stunting and deformities, and possibly death. This may reduce yields in this plantation.

2. Remove Plantation and Replant. The trees in plantation 350 would be removed and the site prepared to rid it of the existing brush. Planting would follow using the proper seed source for the site. A pure plantation of pine could be reintroduced without a high probability of further pitch midge problems if: 1) the proper seed zone and phenotype are used, 2) the brush is kept under control and, 3) the dust from the road is reduced to aid in the prevention of population increases in roadside trees. Use of a species mix of ponderosa pine and Douglas-fir would lessen the potential impact of the pitch midge even further.

Although the initial 18 years of growth of the existing plantation would be lost, the new plantation should not be impacted by gouty pitch midge as long as the brush is controlled and the trees are allowed to grow vigorously.

Projected yields should be attained by the end of the rotation. By removing the large reservoir of pitch midge susceptible host material, there will be less pressure by this insect on the adjacent plantation and these seedlings would then grow at their normal potential.

3. Release and Thin. The existing plantation would be retained. The brush component would be significantly reduced using appropriate measures. Follow-up treatments may be necessary in future years to keep the amount of brush competition reduced until crown closure occurs. Although not directly affecting the gouty pitch midge population, reducing the competition should increase tree vigor sufficiently to reduce the impact of the insect and to allow the trees to grow out of the susceptible size class within a few years. There will probably be a 2 to 3 year lag period between treatment and initial evidence of any recovery. A precommercial thinning at the same time would help to reduce intertree competition and can be used to select against those trees with thin crowns and those most severely affected by gouty pitch midge. In addition, the combination of reducing the brush and intertree competition may result in response to release that offsets some of the lost growth potential that the trees have suffered from the insect. The reduced competition will also be beneficial in future years by reducing the potential for successful attacks by other insects, such as bark beetles. As susceptibility is reduced, populations of the gouty pitch midge will decline in the immediate vicinity and there will be fewer attacks on the trees in the adjacent plantation.